# Barriers to Access to Modern Energy in Slums

## LITERATURE REVIEW

Nigel Scott
Peter Dunn
Susan Sugden

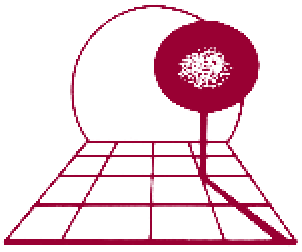
DFID
1 Palace Street
London
SW1E 5HE

Contract No: R8146

January 2003

Crown House
231 Kings Road
Reading
RG1 4LS
UK

phone: 44 (0)118 926 7039
fax: 44 (0)118 919 9514
email: Nigel@gamos.demon.co.uk



Gamos Ltd.

# Contents

# 1 Introduction

By the end of the 19th Century less than 10% of the world's population was urbanised. By 1970 the figure had increased to 35% and further increased to 50% in 2000. Some 50 years ago around 85-90% of the population in developing countries were situated in the rural areas and rural poverty was the main concern in development studies. Whilst the level of urbanisation in the developing countries is still much less than in developed (35% cf 75%) it is rising at four times the rate of the developed nations and is associated with the very much larger population. The increasing drift of rural populations to the towns is due partly to the depression of the agricultural sector and very much more to the attractions of the town. These are perceived as including employment, better conditions, services (water, sanitation electricity and health), schools etc. Sadly these hopes usually prove to be illusory, development is unplanned, and the reality is poor housing, inadequate or zero services, little health care and schooling and high crime rate.

A feature of urban development has been the rise of the mega-city (cities having population greater than I million). Some of these have been in the developed countries, but the majority (20 out of 24) are in the developing countries and are associated with vast `shanty towns' where living conditions are squalid. `Shanty towns' are not confined to the mega-cities and arise whenever unplanned rapid urbanisation takes place. Hence there is a major problem in finding a way in which these people can achieve a decent and sustainable quality of life. This is clearly an enormous and complex problem to which there is no simple solution. Certainly piecemeal solutions are not the right answer. Nevertheless, because of the complexity it is essential to define problems and identify solutions to the individual components necessary for a good quality of life. These include the technical problems such as water supply, sewage, electricity, housing, infrastructure (roads, schools, health centres); employment and industry development; and the political and economic framework.

Whilst the quality of life of the current inhabitants of the `shanty town' is pretty poor and the outlook sombre, one should note the essential resourcefulness and ability to overcome difficulties characteristic of human nature. Vast numbers exist in these conditions, raise their families and even though unemployment is high, a surprising number find some sort of paid work.

This project looks at one aspect required for development, namely electricity supply. It considers the problems and possibilities of increased availability of electricity in slums/shanty towns in the cities of developing countries. The advantages of this include:

i Improved quality of life
ii improved health
iii facilitate more work-places
iv improved educational prospects

The obvious obstacle to such action is the general poverty and hence difficulty in payment. There may also be other obstacles including, in some cases, a lack of suitable social structure in the community necessary to sustain the development.

A simple representation of the interaction between the two sectors is shown in Fig. 1. Some of the issues concerned with the demand and supply interface are presented in Table 1.

**Fig 1. Demand and Supply Interaction**

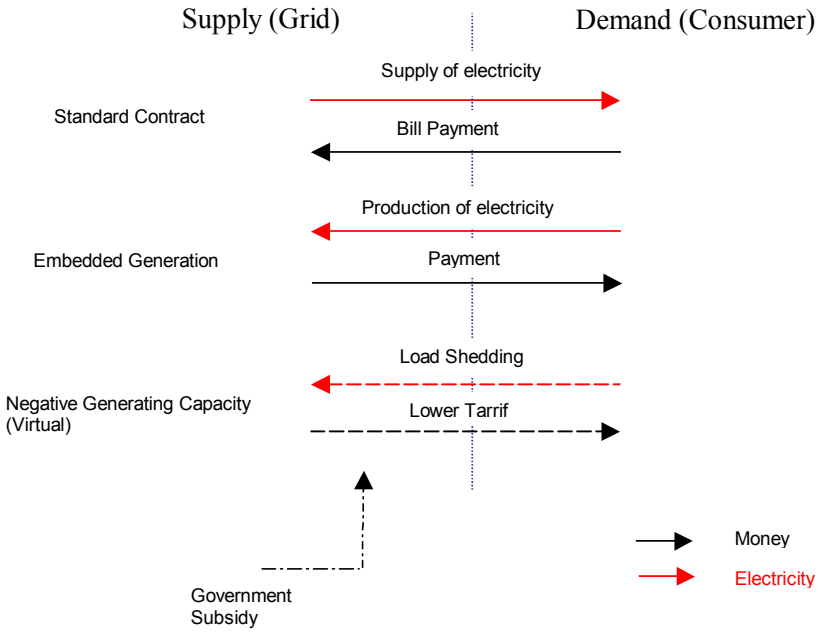



**Table 1. Supply and Demand Interface**

| | ***Supply*** | ***Demand*** |
|---|---|---|
| | | |
| ***Cost*** | *Issues affecting the cost at which supplies can be made available:*<br>• tariffs (connection, standing, and unit charges)<br>• generating, transmission and distribution systems - capacity, age (what exists)<br>• technical options for supply to slums (high connection density)<br>• opportunities for cost reduction<br>• subsidies<br>• education – safety and ownership<br>• cost recovery | *Issues relating to the costs that slum dwellers have to pay:*<br>• patterns of demand (what, when, why, how much etc.)<br>• demand side management options e.g. load shedding<br>• low cost installations (wiring looms)<br>• low cost connections (metering, load limiters etc.)<br>• high efficiency appliances<br>• education – how to manage consumption and costs<br>• participation in management activities |
| ***Access*** | *Issues affecting a supply company's decision to provide access in slums:*<br>• constraints to increased load<br>• incentives to increase number of connections (regulator targets)<br>• timescales for investment / cost recovery<br>• risks e.g. theft, non-payment<br>• legal status of slum customers | *Issues concerning ways in which customers in slums can secure access to a supply:*<br>• procedures for getting connected<br>• priorities in terms of quality of supply<br>• waiting lists<br>• illegal connections<br>• multiple household connections<br>• bribery?<br>• Participation in provision of network |

The contribution the provision of energy can make to improving the lives of the urban poor is well recognised (Table 2). Although the focus of the literature review has been on the provision of electricity to slum communities, it has considered the whole process from

producer to consumer; the limitations and opportunities surrounding the process, including the impact of power sector reform. The conclusions form a basis for highlighting issues to be investigated further in the field research.

**Table 2: Potential effects of improved energy services in alleviating poverty**

| Direct effects on well-being | Direct effects on health | Direct effects on education | Direct effects on economic opportunities for the poor | Trickle Down effect of increased productivity | Fiscal space (coupled with pro-poor policies) |
|---|---|---|---|---|---|
| Improved access to lighting, heat, and refrigeration<br><br>Savings in time and effort (due to reduced need to gather bio-mass and other fuels.<br><br>Improved access to information (through radio, television and telecommunications) | Improved indoor air quality through cleaner fuel<br><br>Reduced fire hazard<br><br>Improved quality of health services (through better lighting, equipment and refrigeration)<br><br>Easier establishment of health centres<br><br>Better Education | Improved access to lighting, allowing more time to study<br><br>Savings in time and effort, releasing time and energy to channel to education | Easier establishment and greater productivity or businesses that employ the poor<br><br>Creation of employment in infrastructure service delivery<br><br>Improved health and education and savings in time and effort, increasing individual productivity | Easier establishment and greater productivity of businesses in general (including through positive impact on the environment) | Smaller fiscal burden and higher fiscal returns from more efficient services<br><br>More benefits to the poor if government spending is effectively channelled to welfare enhancing services<br><br>Higher fiscal returns associated with higher growth, coupled with pro-poor policies |

Source: Waddams Price 2000

# 2 Demand Side

The demand for improved energy provision in the form of electricity is shown through the impact alternative forms of energy cost the poor, both as a percentage of their income and with regards to their wealthier counterparts. In his article on energy and sustainable development, Jamal Saghir (2002) points out that poor people "already pay more for low-quality energy services then the better off people pay for good-quality services". This view is reinforced through looking at table 3 on the financial costs of cooking fuels in Dar es Salaam to the people. As can be seen there is a significant difference between the cost of electricity and the cost of any other energy fuel.

**Table 3: Financial costs of cooking fuels in Dar es Salaam, 1990**
(Tanzanian Shillings)

| Fuel | Fuel Cost (per effective mega joule) | Total monthly appliance cost | Total monthly cost of 320 mega joules |
|---|---|---|---|
| Firewood | 3.94 | n.a. | 1259.35 |
| Charcoal (traditional) | 3.59 | 22.22 | 1169.81 |
| Charcoal (improved) | 2.39 | 125.00 | 890.06 |
| Kerosene | 5.24 | 33.33 | 1709.52 |
| LPG | 3.17 | 208.33 | 1224.21 |
| Electricity | 0.62 | 458.33 | 657.99 |

Source: Hosier and Kipondya 1993 in Foster 2000

## 2.1 Electrical Energy Applications

According to the literature poor households tend to use a variety of energy sources to survive (Brook & Besant Jones 2000, Anneke 2000). A recent analysis by Winkler et al (2000) with

regards to energy usage among South Africans low cost housing has shown that electricity tends to be used for space heating, lighting and water heating. Furthermore, a recent study by Batchelor et al (1999) in rural China showed that low income people used electricity mainly for light (both for people and animals, Television, Refrigeration, the radio and satellite television.

When looking at this issue and how the poor not only perceive it but respond to their actual daily needs there is also a need to see the level to which they are able to respond to this. A recent NERA article on Energy tariffs in Slovakia points out that recent studies have shown that higher usage of electricity does not necessarily coincide with higher incomes (Voll & Juris 2002). Provision of electric light enables activities such as sewing to be carried out after dark. Food stall vendors also make use of electricity. Small industry can be established, preferably in secure compounds. Improving access to energy should also increase peoples amount of spare time, as less time is needed in the collection of traditional fuels or manual labour (Saghir 2002).

Some have argued, "poor families typically include such vulnerable family members as young children and the elderly" (Voll, S & Juris, A 2002). Such people groups that need healthy temperatures, hot water and safe food to eat. Yet their poverty often limits them in their ability to fulfil these needs, whether through access to electricity or other energy sources. The solution to this will of course have to match available income and their prioritisation within the context of other household needs. Experience suggests that there will be a high priority for lighting, communication (TV), and probably cooking. Also, though generally well aware of domestic equipment members of the various communities may not know about new possibilities and savings which may arise from energy efficient equipment and load control.

## 2.2 Electrical Load Demand

### *2.2.1 Barriers arising from costs*

With the notable exception of the former communist countries the access to electricity among poor households is low (see table 4).

**Table 4: Disparities between rich and poor with electricity are often great**

| Country | 1998 GNP per Capita (1998 US dollars) | Percentage of Households with electricity | |
|---|---|---|---|
| | | Poorest Quintile | Richest Quintile |
| Cote d'Ivoire | 700 | 11.0 | 71.0 |
| Ghana | 390 | 7.2 | 43.1 |
| South Africa | 2880 | 13.0 | 94.6 |
| Ecuador | 1530 | 77.9 | 97.5 |
| Jamaica | 1680 | 55.4 | 94.0 |
| Nicaragua | 390 | 28.4 | 93.1 |
| Panama | 3080 | 23.0 | 97.1 |
| Nepal | 210 | 3.7 | 75.0 |
| Pakistan | 480 | 59.8 | 89.6 |
| Vietnam | 330 | 27.4 | 76.3 |
| Albania | 810 | 100.0 | 100.0 |
| Bulgaria | 1230 | 100.0 | 100.0 |
| Kazakhstan | 1310 | 99.7 | 100.0 |
| Kyrgyz Republic | 350 | 99.0 | 100.0 |
| Ukraine | 850 | 99.7 | 99.7 |

Source: LSMS surveys in Komives et al. 2000

One of the reasons identified for this is high connection costs which create a barrier to improving access and the affordability of electricity supplies (DFID Issues Paper 'Energy for the poor', see table 5). If we compare the connection costs to some of the countries GDP we can see the problem. For example, in India table 5 shows the connection costs as US$19.6-29.4, whereas the population living below the poverty line of US$1 a day is 44.2% (UNDP 2001).

**Table 5: Connection costs in Various Countries**

| ***Country*** | ***South Africa*** | ***Cote d'Ivoire*** | ***Gabon*** | ***India*** | ***Indonesia*** | ***Nepal*** |
|---|---|---|---|---|---|---|
| ***Cost* (US$)*** | 29.4 | 58.8 | 58.8 | 19.6 -29.4 | 14.7 | 49 - 58.8 |
| ***GDP per capita (US $PPP)***** | 11,290 | 1,490 | 5,990 | 2,840 | 2,940 | 1,310 |
| ***Percentage (% pc GDP)*** | 0.3 | 3.9 | 1.0 | 0.7 – 1.0 | 0.5 | 3.7 – 4.5 |

*Source: Floor & Masse 2001
** Human Development Report 2003 (UNDP)

An example in DFID's guidance notes is from Ghana where domestic connection charges are too high for the poor. In response to this they began to club together for a meter. However, this increased the electricity usage levels to a point where they entered into the higher commercial rate band. Thereby creating a new set of affordability problems. This issue of price is also shown through the fact that ESKOM in South Africa are constantly lowering the tariffs in an attempt to get the poor connected. However, the poor seem unable to overcome a number of barriers. These include wiring up their houses and in purchasing new appliances (Annecke, W 2000).

Other constraints to do with costs have been highlighted by Christine Kessides (2002). These include the traditional monthly billing method. For many people in poor communities irregular income limits their ability to be able to pay monthly bills. Added to this she highlights the problem that "*the official subsidy schemes are typically inadequate to cover the utility's costs of extending services to a large share of the urban population living in such circumstances. As a result, many of the poor continue to depend on informal, alternative suppliers (or even "black" markets), and they often pay very significant charges for service through these channels".* One solution presented in DFID's Energy for the poor document is the use of credit facilities whereby people can spread payments over a period of time. The pattern of which need not be regular. If we look to other utility sectors we can see some examples of how the poor alongside the government and communities have responded to this situation to lower the price and increase access. In the Orangi slum, Karachi, the slum communities organised themselves into small groups. Led by a local Scholar, Dr Khan, each small group was involved in the design, building and maintenance of toilets and local sewage lines and drains (Human Settlements in Asia 1999). In return the government was responsible for the main drains and the treatment plants. The overall cost of provision for each house was low - $34 for each house plus voluntary labour. The total bill for the project was $1.5 million that was meet almost entirely by the local community (Global Ideas Bank, 2003).

For Townsend 2000 however, the issue of reaching the poor is one of access not of economics. This view is supported by Albouy and Nadifi (1999), who point to the fact that the poor spend more on energy then the rich through indirect sources. They also point to the institutional aspect i.e. sector policies, government interference and incentives. They see liberalisation impacting the poor through economic growth and increased labour productivity. However Bouille et al (2002) point to the rise in unemployment that comes with privatisation and subsequent 'efficiency' strategies that all negatively impact the poor.

We can also learn more about the household economic situation by looking more closely at the communities to be studied in India, the Philippines and South Africa. Through this gaining a clearer picture of the amounts of money paid for other services e.g. water and for rent, how these are collected and their success.

### *2.2.2 Public Services*

In addition to domestic services the use of electricity for public services is very important for raising the living standards and sense of security for people living in slums. Public service usage includes:

I. Street lighting. This helps to discourage crime and vandalism
II. Telephones. This may best be offered as a private sale by an individual.
III. Traffic Lights, Security lights.
IV. Public buildings, Schools, community centres, clinics, police stations.

However, our literature search has brought up very little written on this subject. The more immediate household energy needs appear to have been focused on. Thus showing up another important area to be looked at in our investigations.

## 2.3 Energy Efficient Equipment

In addressing the demands of slum communities for electricity at a price they can afford one answer may lie in the use of energy efficient equipment alongside education on efficient usage. One should bear in mind that doubling the efficiency of use is equivalent to halving the cost for the consumer. Methods for improving efficiency include:

- Lighting – the use of fluorescent, long life bulbs increases efficiency. However this method is currently costly.
- Refrigeration – the use of chest refrigerators and freezers to reduce the amount of temperature rise when failing to close the door; increasing levels of insulation; introducing education in efficient use; possibility of off-peak operation.
- Television and Radio – encouraging the use of modern energy efficient models.
- Other domestic equipment. Available but not relevant to present application.
- High thermal insulation storage heating.
- Heating as for cooking.

Although desirable in principle it may be difficult at first to introduce energy efficient equipment because of initial higher cost and particularly local availability. Available equipment is often cheap and of poor design and construction e.g. refrigerators have poorly fitting doors and inadequate insulation. It is worth noting that following the oil crisis of the early 1970`s Japanese industry redesigned domestic electric equipment such as televisions and refrigerators and achieved a startling improvement in efficiency equivalent to a reduction in energy use of 60-70%.

High efficiency bulbs, though of greatly increased life, have considerably higher cost than conventional filament lamps. Hence some subsidy will be necessary. One possible problem from such subsidy will be the theft and resale in the market. There are several ways by which this can be discouraged and will require investigation.

### 2.4 Safety/Education

Some basic understanding is required of users, partly for reasons of safety (particularly important for children) and for reasons of economy in use. A public-private partnership in Rio de Janeiro includes a focus on safety within their energy extension project. Here local students are trained to teach residents of slum communities about the dangers of electricity as well as methods of improving efficiency and in turn reducing bills. They are paid by the private utility company Light Servicos de Electricidad SA (Gentile-Blackwell, A 2002).

## 3 Supply Side

### 3.1 Basic Supply Considerations: options for Reducing costs

There are a number of options for reducing costs both at the household and the company level. Overall costs can be brought down by improving generation and transmission efficiency, and in particular by addressing distribution losses (both technical and non-technical), which can be as high as 50%. However, the focus of the project is on domestic consumption in low income areas, in which non-technical losses are a particularly important feature (see Section 3.3), but generation efficiency is beyond the scope of this review.

Léautier, F, Jechoutek, K J, & Bachmann, S (2000) put forward the view that there is need to bring into play two concepts to enable countries to provide electricity to the urban poor: 1) looking for synergies between services; 2) 'mobilising private and community resources, to leverage the finances and skills out of the city'. This however all costs money. To cover the costs they suggest "(a) charging more for services so that they can meet the increasing cost of expanding electricity and water networks to peri-urban areas; (b) using transfers to poorer communities as a way to equalise the differential access to services; (c) decentralising functions to local entities in order to better meet the local demands; (d) spending more, in terms of the capital budget to expand services; and (e) bringing in added capacity to deliver by contracting out services to the private sector"'.

#### *3.1.1 Local Generation*

Local generation offers the possibility of some return to the consumer from the utility supplier through electricity sales. The most likely installation is a diesel generator. Combined heat and power seems unlikely unless there happens to be a small industry requiring process heat. Renewable energy does not seem to be promising due to the urban location of slums. Wind, wave and hydro-power resources are not generally available in urban environments. Although biomass can be sourced, its use as a fuel for electricity generation tends to be viable only where conventional fuels are not available, which is not the case in urban centres. This leaves solar (photovoltaic), which is prohibitively expensive when compared with the cost of grid electricity, which is readily available in urban areas.

Options depend on the regulations regarding embedded generation, which comprise legal issues such as what types of equipment are permitted to be connected to the grid and the position regarding independent power producers, technical issues such as connection / protection specifications, and financial issues such as how much a distribution company (or third party) may by required to pay for power. The management of an embedded generation project requires a suitable degree of organisational structure and competence, which may not exist within a community.

### *3.1.2 Household level*

This area has already been talked about briefly. Suggestions have included high efficiency appliances and education. Yet one suggestion put forward by Voll & Juris (2002) puts improving energy efficiency in the hands of the company (energy efficiency programme). The idea is that every household pays a set amount for their energy based on assumptions about usage levels. It is therefore in the company's interest to make sure that each household is as efficient as possible thereby enabling them to be sure of covering costs or even of making a profit. Another option would be the use of prepayment metering (Floor & Masse 2001). This method allows the consumer to create their own budget and allows them to keep track of the amount of money they are spending on electricity. The customer can also follow their own usage patterns on the meter thus reducing their fears of inaccurate readings by the utility company.

### *3.1.3 Community based infrastructure*

Another option for reducing costs is through community infrastructure systems such as multiple household metering; load scheduling / switching. By this is meant connecting a number of households together onto one meter. Floor and Masse (2001) use an example of this from Cambodia. Here the electricity company connect one person in a community (the wholesaler) to their grid with just one meter point. This person then sets up a small distribution company using bamboo poles, trees etc to get the electricity to their neighbours. The electricity company bills the wholesaler for the amount of electricity used and s/he in turn charges their consumer neighbours. This method has allowed the Cambodian electricity company to electrify most of Phnom Penh through only 250 wholesalers. However, this system is not without its problems; for example, the rates that wholesalers charge consumers is not regulated, leading to charge rates that can be two or three time the formal tariff. The high level of complaints, mostly related to the disparity of charges arising between those billed by wholesalers and those billed by the utility, has led the electricity company to consider abandoning the system.

### *3.1.4 Community Participation*

Opportunities exist for slum communities to get involved in the provision of energy into their communities at all levels of the project cycle (Cotton et al 1998). These include

- Planning and design of provision
- Supply of waged labour for installation
- Procurement of equipment and material from local suppliers
- Supply of volunteer labour
- Sharing of cost
- and Maintenance of the installed service.

From a community development perspective the involvement of communities in planning provisions is seen as longer lasting and more successful with regards to payment than other methods. This is due in part to a sense of community ownership, but also, according to Cotton & Tayler, to the fact that it should take into account existing organisations and power structures. As a concept this has been used in other utility provision areas. For example the Prosanear project in Brazil aims to bring water and sanitation into the slum communities. Rather then the government and utility companies going straight in the project began by asking the communities what they wanted. From this point the communities then participated in the planning and design of the service provision. Part of this included creating the legality of the slum housing. This meant that the community people were now recognised as citizens and in turn they have begun to improve their dwellings. The success of the Prosanear project to date has caused it to conclude that *"the poor will pay [for utilities], as long as they understand what they have paid for and receive adequate services for their payments"*

(Katakura, Y & Bakalian, A 1998). This therefore highlights the need for provision to meet the standards required for demand. For electricity this can be translated into meaning an assured supply with few power cuts. However, with regards to community participation Sohail et al (2002) comments that the cost of the community's time needs to be factored in to plans surrounding energy provision. Once the utility provision is up and running co-operatives or local shops could take on the responsibility for meter reading; bill payment; and repairs (Floor & Masse 2001).

## 3.2 Nature of Load

It may be that there is not enough electricity to meet the additional demand arising from provision to slum communities. There are a number of ways in which this can be addressed. One is through Demand Side Management. This concept is also put forward as a way to reduce costs at the community level. DSM is where a company directly manage the demand for power. By operating from a local sub-station DSM offers considerable flexibility by the use of prioritised electronic switching. This can be achieved in several ways including radio signals and high frequency waveforms on the power cables. In turn this makes load shedding and load scheduling possible (Padmanaban & Sakar 2001). The inconvenience of load shedding must be balanced against cost benefits. DSM can also include reducing the amount of electricity used through energy efficiency education, rebates for energy efficient equipment or through time of use tariffs or direct load control. For example, one half of a community get electricity at one point in the day and another section at another point in the day. This would clearly need to be managed well to avoid disputes and to make sure that everyone got some electricity when needed. Also where thermal storage exists, as in refrigeration, it may be possible to switch on appliances during periods of low demand when capacity is available, e.g. at night.

## 3.3 Management of Distribution

Cost recovery is an important factor for any business. The impact of theft, corruption/fraud and non-payment can have a debilitating effect on its effectiveness and efficiency. For the poor the impact is often far greater then for the rich. For they are the first to experience blackouts, limited extension of services and increased tariffs (Lovei & McKechnie 2001).

### *3.3.1 Theft*

In South Africa the problem of the theft of electricity through bi-passing meters using a small piece of wire has caused the Durban Metro Electricity Company to introduce split meters into homes. In the design of this the measure and control unit (mcu) is placed in a secure environment outside the home. Thus significantly reducing the threat of theft through bypassing the meter. The customer instead has only an interface unit in their home (Smart, DJ, 1999). Another angle is to reduce the technical costs associated with electricity transmission to reduce the incentives for theft and increase access to the poor, e.g. load limiting or low cost, prefab wiring.

### *3.3.2 Fraud/Corruption*

Cost recovery is an important factor in determining the effectiveness of a utility company (Floor & Masse 2001). The disabling impact of fraud and corruption in both the public and private sector can therefore have a major impact on the effectiveness of utility companies to deliver any service, no matter how reliable, to the slum communities. This can be through increasing company expenditure or reducing their actual income (IBLF 2002). The problem of corruption then obviously has a major limiting impact on the amount of surplus funds available for a company to be able to actually deliver power and improve services to existing

companies let alone extend delivery. According to Transparency International's Bribe Payers Index 2002 the power generation and transmission sector came fifth out of seventeen in sectors most prone to bribing by officials (DFID Energy for the poor 2002). Lovei and McKechnie (2000) put this down to the traditional institutional arrangements and the large quantities of cash that can be generated. The problem is that corruption and fraud can take many forms within the utility sector, from petty corruption at the metering and billing stage, to corruption at managerial levels for sale contracts. For example it is estimated that only 55% of the energy generated in Bangladesh is paid for (ibid). In tackling this Kirkpatrick & Piesse (2001) point to the needs for governments to promote positive environments, including competitive market condition and proper regulation. While little is directly written on tackling corruption in utility companies much is written about tackling corruption in governments. However, this is not seen as being in isolation from the private sector. For part of tackling corruption is reducing the incentives and opportunities for corruption. This should include reducing face to face contact, addressing low pay, introducing performance management systems and developing better detection and judicial systems for dealing with corruption (see DFID Key sheet on "Fighting corruption" 2001). With regards to the collection of full payment Floor & Masse (2001) call for the need for a good commercial department to keep track of payments and ensure good relations with this higher paying sector.

#### *3.3.3 Non-payment*

Non-payment of bills is not only encountered in poor communities. Albouy & Nadifi (1999) point out that "in some countries, electricity users in the industrial and commercial sectors are so overcharged that they evade payment and bypass grid service". This can cause huge problems as it reduces the revenue base form which companies are able to expand their services. Non-payment can also be caused through a persons inability to get to the company's offices to pay (Floor & Masse 2001). Powell and Starks (2000) suggest that using the local community to participate in bill collection and maintenance can help to tackle this problem. They site an example from Bangladesh where local co-operatives buy power from the grid and then distribute it. These groups are then also responsible for keeping track of local billing and maintenance.

# 4 Government Policy

Policy is important in shaping the energy market. Whether through subsidies, tariffs, regulations etc. There is debate about the usefulness of each. For example, the impact of policy and subsides is shown through an example from India. Here the urban poor switched from biomass to kerosene when it became state-subsidized. This has had a negative impact on health in the slum areas through poor burning and poor ventilation as cooking is brought inside (Dasgupta 2002).

## 4.1 Power Sector Reform

#### *4.1.1 Energy Sector Ownership*

Looking at power sector reform brings us to issues of privatisation and public private partnerships. In the developing countries supply is often inadequate, unreliable and under severe economic stress. Padmanaban and Sakar (2001) write about the problems of electricity supply in India. Here there is not enough electricity to meet demand. This is in part due to high transmission & distribution losses, large commercial losses through poor billing, metering, collection and energy theft; low end use efficiency. Thus the ownership and operation of electrical supply is under consideration in many countries both in the developed

and developing world. According to Leipziger and Foster (2002) there is a large amount of evidence that privatisation of utility companies creates substantial dividends. For example, the private management of services often reduces costs, particularly through competition or proper regulation of prices. It is estimated, that efficiency improvements as a result of Argentina's infrastructure privatisation program "were as much as 1 percent of gross domestic product". (ibid, see also Albouy & Bousha 1998). Added to this is the encouragement by the IMF and World Bank throughout the 1990s for the privatisation of state-owned companies as part of loan conditionality (Bayliss 2001). The assumption is that privatisation will reduce the burden on State funds and encourage outside investment into the country. Thereby improving the economy. Added to this is the assumption that privatisation will increase the efficiency, reduce prices and improve quality of service of the company (Birdsall & Nellis 2002). This is in part due to the introduction of competition (Webb, M 1998), which is based on the assumption that competition will reduce prices and create a new source of capital for the government to cover costs through Foreign Direct Investment.

Much current thought is being given to the privatisation options for the State-owned companies. Privatisation can take many forms e.g. public/private ownership, capitalisation and decentralisation. One example of private-public partnerships comes from Rio de Janeiro. Here the cities main electricity provider (Light Servicos de Electricidad SA) provides the electricity. A $200 million loan is provided through a Banking syndicate managed by Citibank, with MIGA (part of the World Bank) guaranteeing it. The whole scheme is part of the government's utility upgrade programme for Rios de Janeiro, which emphasises not only the upgrading of the network but also meters and transformers. For the low-income residents Light offers a 42% discount on meter installation, payment can also be carried out through 24 $3 instalments. Judging by the number of slums reached to date this programme appears successful. It is estimated that each slum will begin to make a profit after 5 years (Gentile-Blackwell 2002). A less positive example is from the Dominican Republic. Here the government privatise the distribution and generation components, whilst retaining control over transmission in 1999. The aim was to encourage a smooth transition to complete privatisation with little cost implications to the voting public. However, as distribution and generation prices rose inline with inflation and oil prices the government was forced to increase their subsidies. They soon amounted debts of US$100 million to the private companies. The result has been frequent 24hr blackouts and the subsequent with holding of bill payment by consumers. The government is still planning to privatise transmission in accord with World Bank requirements (Bayliss, K 2001).

Léautier, F, Jechoutek, K J, & Bachmann, S (2000) also view the solution to improved energy services to lie in "mobilising private investment and know-how, in partnership with local governments and communities". This would be achieved through "encouraging decentralised business models that are less cumbersome than the old utility model"; and "reforming the electricity industry and opening it up to the market, so the new business models can be accommodated and nurtured, and utilities themselves can become efficient, commercially operating, and consumer-friendly power enterprises".

One of the problems with privatisation in general is that the entity to be privatised needs to be sufficiently attractive to encourage private sector investment. This is shown through the successful example of Bolivia recent restructuring. Here 50% of the state owned electricity companies shares was sold to private companies, 5% given to the company's employees, and 45% into a private pension fund. The result has been that it has successfully brought about foreign investment, whilst at the same time increasing the number of electricity connections which have not by-passed the poor (Barja & Urquiola 2001). In contrast the Southern African Energy sector has failed to make itself attractive. Anneke puts this down in part to current levels of international debt, a weak economic administration and political instability. Even the recent moves to democracy over the past few decades have not been enough, as the real problem lies in high inflation and interest rates (Anneke 2000).

Against the view for privatisation is also the point of reduced electricity price subsidies that will directly impact the poor and a reduced profile of the government. This move away from traditional monopolistic approaches to competition, bill payment and service standards is not without its problems for governments. The administration involved is costly. The traditional approach also carries with it institutional and financial obstacles relating to its format. Problems such as the physical haphazard layout of slums, as opposed to the more even middle class housing layout of individual plots (Kessides, 2002). Townsend (2000) however feels that the impact to the poor will be positive where it is implemented alongside policies to protect the poor, and because it should improve their access and service quality. The problem in proving this is currently information on the subject matter is poor.

One aspect of privatisation is the extension of networks. Increasing competition may reduce prices, which may make grid extensions appear more viable in view of increased demand, but this may not necessarily be sufficient to attract investment in network extension. Whatever approach the reform takes its objectives and the new roles of each party involved need to be clear to all, especially if it includes targeting distribution to slum areas (Webb, M 1998, Powell, S & Starks,, M 2000, Patterson et al 2002). In Christine Kessides view there is a need to "*make the infrastructure utilities more responsive and effective in reaching poor and irregular urban settlements".* In her view this requires a change to conventional practices, including privatisation. Privatisation that includes small scale entrepreneurs in the settlements in utility provision – *"'Bulk supply', whereby an entrepreneur or community group purchases water or electricity from the formal network supplier for distribution within a neighbourhood*" (Kessides 2002). For Cowen and Tynan (1999) it is not just small scale entrepreneurs that need to be included it is also the local mafia and black market. Whatever the specific problems Brook and Smith point out that the impact of any reform to the poor very much depends on the governments commitment to them as a group.

### *4.1.2 Regulation Subsidies Tariffs*

Regulation of the energy sector is one way to make sure that providers maintain an "acceptable" level of service and include provision to the poor. An acceptable level of service could include such items as the quality of supply (voltage/frequency specifications), price restriction targets (linked to number & type of connections) and the time scale for investments. The form the regulation takes needs to focus on both 1. price control and outcomes, and 2. the initial provision of electricity - taking into account the needs of investors, the government and consumers (Ugaz 2001). In the area of local network expansion there are two primary funding considerations

i Purchase and installation of equipment to establish the system.
ii Continuing funding to cover electricity costs.

In addition a smaller sum would be needed to cover maintenance and education. However, as Barberton points out, the form the regulation takes is not just important in reaching the poor but also important in creating incentives for private investment and demand side management (Barberton 2000).

Along side regulation are suggestions to lower connection charges or extending credit to the poor (Floor & Masse 2001). For example, SONEL in Cameroon reduced their connection charge by 25% and increased their customer base by 18,000 (ibid). Covering the costs of this can be through future profit margins or through government subsidies or tariffs. Tariffs can take many forms:

Lifeline Tariffs - Lifeline rates provide a block on electricity subsidy at a certain rate (ibid). This is linked to government estimates regarding consumption levels to satisfy a households basic needs (cooking, lighting, refrigeration). One method of covering the electricity

companies overall costs is that the government could pay 50% of the estimated electricity consumption. Voll & Juris suggest that the funding for this could be through a special fee to all domestic electricity users, i.e. cross subsidy.

Social Tariffs - Cowen and Tynan (1999) write about social tariffs having the potential to create a disincentive to companies to supply low-income areas with electricity. This is because the tariffs are often paid for through higher charges to the commercial sector. A recent article from NERA with regards to the restructuring of the Slovakian Energy sector takes this point further (Voll, S & Juris, A 2002). Voll & Juris say that it may even push companies to produce their own generation, probably very inefficiently, and in so doing cause the energy provider to loose their best customers. If it is covered through fuel taxation the rise in costs will negatively impact the poor.

Targeting of tariffs - Targeting of specific communities is one option on the supply side. Voll & Juris (2002) note however that this is often costly in terms of administration overheads. A negative factor for many poor country governments or for companies who have low administrative capacity.

General Tariffs - Voll & Juris highlight that compared to targeting and metering, across the board tariffing is cheaper both in terms of administration costs and infrastructure costs.

With regards to the poor a major consideration is that subsidies and tariffs often don't reach the poor, as they are not connected to the mains. In Honduras it is estimated that 80% of electricity subsidies go to the non-poor (Leipzeger and Foster 2002). Two of the reasons for this are 1. the non-legal nature of many low-income settlements, i.e. slums; and 2. the irregular income of the poor that leads to poor bill payment (Voll, S & Juris, A 2002 ). Both reasons provide low incentives to utility companies to provide any level of service. Kessides, therefore puts forward the view for the removal of tariffs. In its place companies would be required to offer flexible payment options and providing credit for initial connection. For Slovakia the lack of connection is a very small problem and it is suggested that it be addressed through temporary supply provision (ibid). With the cost of installation being covered by the government whilst they seek to address the social issues. They also point out the need to include energy efficiency education to people to try to help them reduce their overall usage.

### 4.2 Legality of land tenure

A major constraint to access often lies in the fact that many slum communities have no legal standing. According to DFID this legal barrier calls for the need for reform (DFID Issues paper: Energy For the Poor: Underpinning the Millennium Development Goals, 2002). But, as they point out, this may bring tensions within government as with legality brings certain responsibilities for the government, due to their subsequent need to provide infrastructure to these areas. A situation which is costly and which many developing countries cannot afford. On the positive side we have seen through the example of Prosanear and Light how through linking utility provision and legality brings about change more far-reaching than just utility provision. This can be seen through Sao Paulo, Brazil programme to electrify slum areas resulted in people being able to clean their homes properly and reduced their fear of fire accidents. These communities began to be seen as real customers and through gaining legal status were able to access credit systems - for their utility bill worked as a proof of residence (Patterson et al 2002).

## 5 Conclusions and Direction for Research

A report on a World Bank sponsored Workshop on Global Coalitions of Voices of the Poor (Narayan and Shah, 2000) opens with a quote from a participant from Brazil:

> *"Sometimes they do not even let you talk. They say they already know the problem and that they will solve it."*

Whilst this comment was made in the context of emerging information technology, and its potential to redress imbalances of power in decision –making processes that affects the lives of the poor, it may also be applicable to the provision of electricity services. The project will, therefore, seek to explore the opinions and priorities of the poor themselves.

Privatisation policies have been implemented with a view to attracting investment, but attention has been paid more recently to the impact on the poor, and the literature highlights a recognition that little empirical data exists. It is also pointed out that little data on energy demand exists to inform energy sector projects, and it is recognised that the demand amongst poor communities will have its own, unique characteristics. It is, therefore, important that the research gathers data on current practice and electrical demand from a cross section of slum society in each country (domestic, industry, public services).

The literature highlights a number of problems faced both by the poor in securing an electrical supply (such as affordability and access), and by distribution companies in making supplies available on a sustainable basis (such as cost recovery and cost of infrastructure). The research can, therefore, produce some useful findings by gathering data on a range of issues concerning the distributor–customer interface:

- Constraints to electricity supplies – there seems to be debate in the literature as to whether principle constraints are economic i.e. people can't afford electricity, or access i.e. they simply aren't able to get the utility to provide a supply.

- Payment mechanisms – utilities experience problems with non-payment (and theft). What are the reasons behind this? Explore how people pay for other services e.g. water, rent.

- Participation – look for examples of ways in which residents (and community representatives such as local councils) have been involved in utility service provision, and ways in which it might be possible for them to participate.

- Quality of supply – what problems are encountered at present e.g. load shedding, voltage drop, connection tripping (illegal connections)? What are priorities for customers?

There is degree of interaction between these, but in summary, the research should investigate the Distributor-Customer management chain, with a view to gaining an understanding of the concerns and priorities present on both sides, and identifying ways in which current practice may be tailored to accommodate these, in order to promote more effective provision of utility services. The project logical framework includes country surveys amongst the outputs, which will provide opportunities for the project to gather the type of data found to be needed (e.g. problem with electrical supplies, constraints, energy use, etc.). Country visits will also provide opportunities to loom for examples of innovative payment mechanisms and participation of consumers. Conclusions from the literature review will, therefore, inform the design of surveys.

# 6 References

**R7182** - Energy Provision to the Urban Poor http://www.etsu.com/dfid-kar-energy/html/r7182.htm

**R7661** - Energy, Poverty and Sustainable Urban Livelihoods http://www.etsu.com/dfid-kar-energy/html/r7661.htm

Albouy, Y & Bousha, R 1998 **The impact of IPPs in Developing Countries – Out of the crisis and into the future**, (World Bank publication 'Public policy for the private sector, Note 162, Dec 1998) www.worldbank.org/html/fpd/notes/162/162summary.html

Albouy, Y & Nadifi, N 1999 **Impact of Power Sector Reform on the Poor: A Review of Issues and the Literature** The World Bank wbln0018.worldbank.org/.../439eb3b648f5b402852569060079b75c/8525690b0065f5d1852568a30057dad8?OpenDocument

Anneke, W 2000 **Assessment of the impact of the Southern African Power Pool on the poor of the region** (EDRC report no: EDRC/00/R15)

Barberton, C 2000 **Exploring the possible impact of electricity supply industry restructuring on demand side management** (EDRC report no: EDRC/00/R1)

Barja, G & Urquiola, M 2001 **Capitalisation, Regulation & the Poor: access to basic services in Bolivia** (World Institute for Development Economics Research)

Batchelor, S, Scott, N, Daoqi, L & Bagen 1999 **Evaluating the impact of Wind Generators in Inner Mongolia: Project Technical Report** (Gamos Ltd for DFID: Reading)

Bayliss, K 2001 **Privatisation of electricity Distribution: some economic, Social & Political Perspectives** (Public Services Research Unit)

Birdsall, N & Nellis, J 2002 **Winners & Losers: Assessing the distributional impact of privatisation** (Centre for Global Development Working Paper #6)

Bouille, D et al 2002 **Power Politics: Equity and Environment in Electricity Reform**, http://www.wri.org/governance/powerpolitics_toc.html

Brook, P & Besant-Jones, J 2000 **Reaching the poor in the age of energy reform,** Chapter 1 ESMAP Energy Report 2000 http://www.worldbank.org/html/fpd/esmap/energy_report2000/ch1.pdf

Brook, P and Smith, WP 2000 **Better energy services for the poor** Chapter 12 ESMAP Energy Report 2000 www.worldbank.org/html/fpd/esmap/energy_report2000/ch12.pdf

Cotton, A P, Sohail, M & Tayler, WK 1998 **Communities Initiatives in Urban Infrastructure** (Water, Engineering and Development Centre, Loughborough University)

Cotton, A P & Tayler, W (no date) **Services for the urban Poor: Guidelines for Policy Makers, Planners and Engineers** (Water, Engineering and Development Centre, Loughborough University)

Cowen, P B & Tynan, N 1999 **Reaching the Urban Poor with Private Infrastructure,** (World Bank publication 'Public policy for the private sector, Note 188) www.worldbank.org/html/fpd/notes/188/188cowen.pdf

Dasgupta, N 2002**Left on the back burner: time to put energy onto the urban planning agenda? http://www.id21.org/zinter/id21zinter.exe?a=0&i=U3nd1g1&u=3e2414a7**

DFID 2002 **Energy For the Poor: Underpinning the Millennium Development Goals** DFID Issues paper, August 2002

DFID 2001 **Key Sheets for Sustainable Livelihoods: Fighting Corruption: An Overview** http://keysheets.org/red_6_corruption_rev.pdf

Floor, W & Masse, R 2001 **Peri-urban Electricity consumers – a forgotten but important group: What can we do to electrify them?** October 2001Joint UNDP/ESMAP paper www.worldbank.org/html/fpd/esmap/publication/periurban.html

Foster, V 2000 **Measuring the impact of energy reform – practical options** (chapter 4 in ESMAP energy report 2000)

Gentile-Blackwell, A 2002 **Bringing Light to Rio's Slums,** MIGA-backed power project tackles outages and safety hazards, http://www.ifc.org/publications/pubs/impact/issue2/ablackwell/ablackwell.html

Global Ideas Bank 2003 Orangi Slums transforms by street committees and small loans http://www.globalideasbank.org/BI/BI-263.html (accessed January 2003)

Human Settlements in Asia 1999 T**he Orangi Pilot Project in Karachi, Pakistan** (The Best Practices Initiatives, Human settlements in Asia Gateway to Urban planning and Management in Asia) http://www.hsd.ait.ac.th/bestprac/orangi.html

International Business Leaders Forum (IBLF) 2002 **Business and Corruption: Promoting the role of business in combating corruption** (IBLF: London) http://www.IBLF.org/corruption

Katakura, Y & Bakalian, A 1998 **Prosanear: People Poverty & Pipes** UNDP/World Bank Water and Sanitation Programme Working Paper, September 1998)

Kessides, C 2002 **A Framework of Economic Policies for Urban Upgrading,** (contribution to The World Bank Workshop on Scaling Up Urban Upgrading in Latin World Bank Workshop on Scaling Up Urban Upgrading in Latin America) **http://wbln0018.worldbank.org/External/Urban/UrbanDev.nsf/Urban+Slums+&+Upgrading/D580201B786CDA438525694300715F39?OpenDocument**

Kirkpatrick, C and Piesse, J 2001 **Regulation for Enterprise Development and Regulatory Impact Assessment** (EDIAS) http://www.enterprise-impact.org.uk/informationresources/application/regulatoryframeworks.shtml

Komives, K, Whittington, D & Wu, X 2000 **Energy Use around the World – evidence from household surveys** (Annex to chapter 2 in ESMAP Energy Report 2000)

Léautier, F, Jechoutek, K J, & Bachmann, S 2000 **Empowering the Urban Frontier: Electricity for Peri-Urban Communities** (The Journal Online Issue September 2000, City Development Strategies Initiative (CDSI) http://www.citydev.org/journal/sep00/journal_f15.html

Leipziger, D and Foster, V 2002 **Is Privatisation Good for the Poor? http://www.ifc.org/publications/pubs/impact/issue2/dl-vf/dl-vf.html**

Lovei, L & McKechnie, A 2000 **The costs of corruption for the poor** (Chapter 8 in ESMAP Energy Report 2000: World Bank)

**Maintaining Utility services for the poor. (print out). http://www.worldbank.org/wbi/attackingpoverty/eca/maintainingutilities.pdf**

Narayan, D and Shah, T 2000 **Connecting the local to the Global: Voices of the Poor** (Framework Paper prepared for 11-13 December 2000 workshop on Local to Global connectivity for Voices of the Poor, World Bank)

Padmanaban, S & Sarkar, A 2001 **Electricity Demand Side Management (DSM) in India: A Strategic and Policy Perspective,** Office of Energy, Environmental, and Enterprise, USAID/India http://www.usaid.gov/in/whatsnew/articles/dsm.htm

Patterson,W, Eberhard, A & Suarez, CE 2002 **Towards sustainable electricity policy** in Energy for sustainable development: a policy agenda Johansson, TB & Goldenberg, J (eds) 2002 (UNDP) http:// www.undp.org/seed/eap/html.publications/2002/20013108FNRapport.pdf

Powell, S & Starks, M 2000 **Does Reform of Energy Sector Networks Improve Access for the Poor?** (World Bank publication 'Public policy for the private sector, Note 209, May 2000) www.worldbank.org/html/fpd/notes/209/209summary.html

Smart, DJ 1999 **Pre-payment – Separate consumer interface increases flexibility and security** (Conlog (Pty) Ltd, Durban South Africa) http://www.metering.com/archive/994/p28-1.htm

Saghir, J 2002 **The role of energy in sustainable development** in *Renewable Energy for Development Newsletter* vol 15, no 1/ 2 Dec 2002 pp10-11 (Stockholm Environment Institute)

Sohail, M, Cavill, S & Cotton, AP 2001 **Operation, Maintenance and Sustainability of Services for Urban Poor: Findings, Lessons learned and Case Studies Summary & Analysis** (Water, Engineering and Development Centre, Loughborough University)

Sohail, M & Cotton, A P 2001**Public- Private Partnerships & the Poor : Interim findings Part A (Summary & lessons Learned)** (Water, Engineering and Development Centre, Loughborough University)

Townsend, A 2000 **Energy access, energy demand, and the information deficit,** Chapter 2 ESMAP Energy Report 2000 http://www.worldbank.org/html/fpd/esmap/energy_report2000/ch2.pdf

Ugaz, A 2001 **A Public Goods Approach to the Regulation of Utilities** (World Institute for Development Economics research Discussion Paper #2001/9)

UNDP 2001 **Human Development Report**

Villagran, E 2000 **Key drivers of improved access- off-grid service,** Chapter 6 ESMAP Energy Report 2000www.worldbank.org/html/fpd/esmap/energy_report2000/ch6.pdf

Waddams Price, C 2000 **Better energy services, better energy sectors - and the links with the poor,** Chapter 3 ESMAP Energy Report 2000 http://www.worldbank.org/html/fpd/esmap/energy_report2000/ch3.pdf

Webb, M 1998**Power Sector Reform and Regulation,**. (London Economics, Paper presented at the Seminar on the Economics of regulation, Mexico City) www.cre.gob.mx/cid/docinv/mwebb-power.pdf

Winkler, H, Feches, RS, Tyani, L & Matibe, K 2000 **Cost benefit analysis of energy efficiency in low cost housing** (EDRC report no: EDRC/00/R9)

Voll, S & Juris, A 2002 **Alleviation of the Social Impacts of Energy Tariff Rationalization in Slovakia: Identification of Suitable Consumer Assistance Programs** (NERA Economic Consulting) http://www.nera.com/_template.cfm?c=6167&o=5732